

ENVIRONMENT

INFORMATION

ENVIRONNEMENT

WINTER 1992



Environment
Environnement

AUG 14 1992

CHECKLIST AND CATALOGUE SERVICE

2-NITROPROPANE

CATEGORIZATION AS A HAZARDOUS WASTE

THE PROPOSAL

The Ontario Ministry of the Environment administers the *Environmental Protection Act*. Schedule 1 of Regulation 309 made under this act lists some industrial processes in which hazardous wastes are generated. Waste streams from these processes typically have a high concentration of hazardous chemicals.

The Ministry is proposing to categorize wastes from industrial processes using 2-nitropropane as a solvent as hazardous industrial wastes. This would be done by listing these processes in Schedule 1 of the regulation.

Companies using such processes would then be required to comply with the provisions of Regulation 309 concerning the disposal of hazardous wastes.

Those firms generating waste from the manufacture, distribution, or storage of the chemical are already subject to the provisions of the regulation because it is now listed in Schedule 2, a listing of hazardous waste.

2-nitropropane is also known under the trade name Ni-Par S-20 or NiPar S-30.

For an explanation of the two ways, categorization, and review, in which the schedules in the Regulation may be updated you are referred to the Ministry's publication, *A Guide to Hazardous Waste Categorization and Review*.

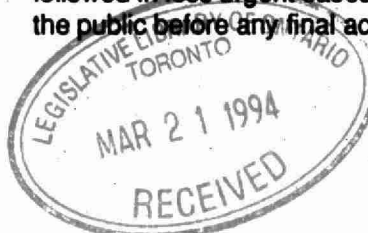
THE CATEGORIZATION PROCEDURE

The updating of a Schedule by categorization begins with an application in writing to the hazardous waste review unit (HWRU) at the Waste Management Branch, Ministry of the Environment. Applications may come from agencies having regulatory responsibility for health and the environment, from concerned organizations, or from the public at large.

Upon receipt of an application the HWRU prepares a Categorization Background Document. This document provides an extensive evaluation of the data on toxicity of the contaminant in question, and on its potential impact on human health and on the environment. If in the opinion of the HWRU there are sufficient grounds to proceed further the application is evaluated by the hazardous waste review committee (HWRC) consisting of representatives of the Waste Management Branch, other Ministry of the Environment branches, and the Ontario Ministry of Labour. It may also be circulated to other environmental services branches within the Ministry for technical evaluation. Following this evaluation the HWRC submits a recommendation for approval to the director of the Waste Management Branch.

If the case is considered to be urgent, the approved recommendation is forwarded directly to the Minister of the Environment, who makes the final decision.

An important part of the categorization procedure followed in less urgent cases is full consultation with the public before any final action is taken. Opinions



Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca

expressed as a result of this consultation will be reviewed, together with the recommendation of the internal committee and other information, by an independent Hazardous Waste Advisory Committee. This committee, made up of persons from the scientific and academic communities and from public interest groups, makes the final recommendation to the Minister of the Environment regarding the proposed categorization.

Selected properties of 2-nitropropane

Chemical formula : $C_3H_7NO_2$
Density : 0.988 g/cc at 20°C
Melting point : -91.3°C
Boiling point : 120.3°C
Solubility : 17000 ppm in water at 25°C
Flash Point (open cup) : 37.8°C
Volatility : vapour pressure 13 mm Hg at 20°C

USES

Since 1988 2-nitropropane has been used in Ontario solely in the ink formulation industry. Even there it is being phased out because of its toxicity.

In other jurisdictions it is used as an intermediate in the production of other chemicals or as a solvent to separate one product of a chemical reaction from others.

PRODUCTION

2-nitropropane is not produced in Canada and its importation has declined from 32 tonnes in 1986 to .6 tonne in 1989 with a further reduction expected. In the United States the production process used involves the vapour phase reaction of nitric acid with propane. The product, containing about 46% nitropropane is further refined and distilled to yield the desired chemical.

2-NITROPROPANE AS A WASTE

Although the amount of 2-nitropropane imported into Canada has declined from 32,000 kg as of 1986, to 606 kg as of 1989, it continues to be used in the ink formulation industry. Inks based on this chemical typically contain 28% 2-nitropropane. The annual generation of waste in the form of spent solvent and the residue from recovery processes was estimated at 4,364 kg in 1987. Presumably the amount of waste will have declined in proportion to the reduction in imports. If so there would have been a little over

100 kg of waste of this type generated in 1989. Much of this may have been recovered, leaving the residue in the form of "still bottoms" containing only about 10% 2-nitropropane for disposal. Nevertheless because of its toxicity even small amounts must be disposed of properly.

Off-specification products containing 2-nitropropane which become waste are already subject to Regulation 309 because it is listed in Schedule 2.

HEALTH HAZARDS OF 2-NITROPROPANE

The Ministry of the Environment uses a rating system to assess the different types of hazard to human health from toxic substances. This assigns a score from zero, representing no risk, to ten for maximum risk for each hazard, based on the results of laboratory tests. If the score is above a given level, referred to as the concern level the substance is considered to present a significant risk with respect to that type of hazard.

Those given non-zero scores with respect to 2-nitropropane included:

Acute lethality, which is the hazard of death from a single dose, scored 4 with a concern level of 6. The score was based on the results of tests on mice and rats; those on fish were negative.

Sub-lethal effects such as changes in rate of growth or of bodily functions, may be noted in tests on animals, both mammals and non-mammals, or on plants. 2-nitropropane caused an increase in the weight of, and damage to, the livers of rats. There are also reports of irritation of the respiratory tracts of humans exposed to concentrations in the range of 30 to 300 ppm. These effects are considered serious enough to score sub-lethal effects on mammals at 4, just the concern level for this hazard.

Mutagenicity, the potential to cause genetic change, was shown in most but not in all of the studies done. These studies included tests on human cell cultures and on laboratory animals. The mutagenicity of this chemical is scored at 8, above the concern level of 6.

Carcinogenicity, the capability of a substance to cause cancer was demonstrated in tests on rats. In addition, 2-nitropropane is suspected of having human carcinogenic potential. It is scored at 10, the highest level, for a hazard in which the concern level is 2.

OTHER HAZARDOUS PROPERTIES OF 2-NITROPROPANE

According to Regulation 309 a waste is considered hazardous if it exhibits at least one of the following characteristics; corrosiveness, ignitability, reactivity, or leachate toxicity. Of these only ignitability is exhibited by 2-nitropropane. This, together with the scores noted above, makes some aspects of its environmental behaviour of concern when the disposal of wastes containing it are considered. Three of these have been identified and scores relative to 2-nitropropane assigned to two of them.

Environmental mobility refers to the dispersion of a material in water and in air. 2-nitropropane being both soluble in water and volatile, receives a score of 10 for mobility against a concern level of 7.

Environmental persistence of a pollutant is a measure of the length of time before the substance degrades to some less harmful compounds or elements. 2-nitropropane is not readily degraded either by light in the lower atmosphere, nor by hydrolysis in ground water. It has been shown to be biodegradable in soil and water but the processes are expected to be slow. It is considered to be moderately persistent but because of limited data no numerical score has been assigned (as of August 1991).

Environmental exposure is a measure of the potential that humans or other organisms will actually come into contact with a hazardous chemical waste. If wastes from processes using 2-nitropropane as a solvent were to continue to be disposed of in landfills and there were a case of mismanagement at such a site the volatility of the solvent could create an air pollution problem. In addition its solubility could lead to contamination of ground water. These considerations together warrant a score of 7, the concern level for environmental exposure.

PRESENT REGULATIONS

2-nitropropane is now listed as a hazardous waste chemical in Schedule 2 of Regulation 309. Materials so listed are commercial chemical products or intermediates that are unacceptable for use, for instance because they fail to meet product specifications.

The use of this solvent is also regulated under the Workplace Hazardous Materials Information System (WHMIS) Regulations of the Ontario *Occupational Health and Safety Act*, administered by the Ministry of Labour. The regulations prescribe the safety measures to be taken by workers in using the chemical.

It is classified as a flammable liquid under the federal *Transportation of Dangerous Goods Act* and identified as moderately flammable for international air transport and for international marine transport of waste.

In the United States it is listed as a hazardous waste if disposed of as a spent solvent or as still bottoms.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that 2-nitropropane presents a serious risk to the human health because it may have the potential to cause human cancer, aggravated by its mobility and persistence in the environment. It presents some risk to the environment by reason of its ignitability. These considerations justify the recommendation that 2-nitropropane should be listed in Schedule 1 of Regulation 309, of Ontario's *Environmental Protection Act*.

For more information contact:

Ministry of the Environment
Waste Management Branch
2 St. Clair Ave. West, 14th Floor
Toronto Ontario M4V 1L5
Or Call: 323-5200 (in Toronto)
1-800-268-4483 (toll free)

Version française disponible



PRINTED ON
RECYCLED PAPER
IMPRIMÉ SUR
DU PAPIER RECYCLÉ

PIBS 1840E Vol. 2
0.3M/02/92